TB-FMCH-VBY1
Hardware User Manual

Rev.2.03

Revision History

Version	Date	Description	Publisher
Rev.0.01		Preliminary	Nagatani
Rev.0.02	2009/09/14	Modify model number of FMC	Nagatani
Rev.0.03	2009/09/17	Changed all pin assignment of FMC	Nagatani
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Rev.2.01	2010/06/03	Changed document format	Yoshioka
Rev.2.02	2011/08/08	Changed Table7(-1/2/3/4) *FMC Pin Name: HTPDN/LOCKN/OPTION	Toda
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Introduction

Thank you for purchasing the **TB-FMCH-VBY1** board. Before using the product, be sure to carefully read this user manual and fully understand how to correctly use the product. First read through this manual, then always keep it handy.

SAFETY PRECAUTIONS

Be sure to observe these precautions

Observe the precautions listed below to prevent injuries to you or other personnel or damage to property.

- **Before using the product, read these safety precautions carefully to assure correct use.**
- **These precautions contain serious safety instructions that must be observed.**
- **After reading through this manual, be sure to always keep it handy.**

The following conventions are used to indicate the possibility of injury/damage and classify precautions if the product is handled incorrectly.

Danger	Indicates the high possibility of serious injury or death if the product is handled incorrectly.
Warning	Indicates the possibility of serious injury or death if the product is handled incorrectly.
Caution	Indicates the possibility of injury or physical damage in connection with houses or household goods if the product is handled incorrectly.

The following graphical symbols are used to indicate and classify precautions in this manual.
(Examples)

	Turn off the power switch.
	Do not disassemble the product.
	Do not attempt this.

Warning	
	In the event of a failure, disconnect the power supply. If the product is used as is, a fire or electric shock may occur. Disconnect the power supply immediately and contact our sales personnel for repair.
	If an unpleasant smell or smoking occurs, disconnect the power supply. If the product is used as is, a fire or electric shock may occur. Disconnect the power supply immediately. After verifying that no smoking is observed, contact our sales personnel for repair.
	Do not disassemble, repair or modify the product. Otherwise, a fire or electric shock may occur due to a short circuit or heat generation. For inspection, modification or repair, contact our sales personnel.
	Do not touch a cooling fan. As a cooling fan rotates in high speed, do not put your hand close to it. Otherwise, it may cause injury to persons. Never touch a rotating cooling fan.
	Do not place the product on unstable locations. Otherwise, it may drop or fall, resulting in injury to persons or failure.
	If the product is dropped or damaged, do not use it as is. Otherwise, a fire or electric shock may occur.
	Do not touch the product with a metallic object. Otherwise, a fire or electric shock may occur.
	Do not place the product in dusty or humid locations or where water may splash. Otherwise, a fire or electric shock may occur.
	Do not get the product wet or touch it with a wet hand. Otherwise, the product may break down or it may cause a fire, smoking or electric shock.
	Do not touch a connector on the product (gold-plated portion). Otherwise, the surface of a connector may be contaminated with sweat or skin oil, resulting in contact failure of a connector or it may cause a malfunction, fire or electric shock due to static electricity.

Caution	
	Do not use or place the product in the following locations. • Humid and dusty locations • Airless locations such as closet or bookshelf • Locations which receive oily smoke or steam • Locations exposed to direct sunlight • Locations close to heating equipment • Closed inside of a car where the temperature becomes high • Staticky locations • Locations close to water or chemicals Otherwise, a fire, electric shock, accident or deformation may occur due to a short circuit or heat generation.
	Do not place heavy things on the product. Otherwise, the product may be damaged.

■ Disclaimer

This product is a board intended for conversion between the Samtec FMC connector and the Hirose FX16 Series connector. And interfacing by the V-by-One specification of the THine Electronics,Inc. Tokyo Electron Device Limited assumes no responsibility for any damages resulting from the use of this product for purposes other than those stated.

Even if the product is used properly, Tokyo Electron Device Limited assumes no responsibility for any damages caused by:

(1) Earthquake, thunder, natural disaster or fire resulting from the use beyond our responsibility, acts by a third party or other accidents, the customer's willful or accidental misuse or use under other abnormal conditions.
(2) Secondary impact arising from use of this product or its unusable state (business interruption or others)
(3) Use of this product against the instructions given in this manual.
(4) Malfunctions due to connection to other devices.

Tokyo Electron Device Limited assumes no responsibility or liability for:

(1) Erasure or corruption of data arising from use of this product.
(2) Any consequences or other abnormalities arising from use of this product, or
(3) Damage of this product not due to our responsibility or failure due to modification

This product has been developed by assuming its use for research, testing or evaluation. It is not authorized for use in any system or application that requires high reliability.

Repair of this product is carried out by replacing it on a chargeable basis, not repairing the faulty devices. However, non-chargeable replacement is offered for initial failure if such notification is received within two weeks after delivery of the product.

The specification of this product is subject to change without prior notice.

The product is subject to discontinuation without prior notice.

1. Related Documents and Board Accessories

Related documents:

All documents relating to this board can be downloaded from our website. Please see attached paper on the products.

Board accessories:

- Custom cable
- FMC spacer set
  M2.6 X 10 spacer (Duracon): 2
  Screws with Duracon washer: 4
- Jumper socket set
  Jumper socket: 10

2. Overview

This board is intended to be used for conversion between Samtec FMC (High-Pin Count) and Hirose FX16 Series connectors. The board can achieve THine Electronics,Inc V-by-One HS (Max 3.75Gbps) transfer speeds. The board has been designed for connection with high-pin-count platform boards.

3. Features

FMC Connector:	Samtec FMC Connector (High-Pin Count)
LVDS Connector:	Hirose FX16 Series
Signal Selection:	A jumper switch to select signal lines
Voltage Selection:	A jumper switch to select voltage

	K	J	H	G	F	E	D	C	B	A
1	VREF_B_M2C	GND	VREF_A_M2C	GND	PG_M2C	GND	PG_C2M	GND	RES1	GND
2	GND	CLK3_M2C_P	PRSNT_M2C_L	CLK1_M2C_P	GND	HA01_P_CC	GND	DP0_C2M_P	GND	DP1_M2C_P
3	GND	CLK3_M2C_N	GND	CLK1_M2C_N	GND	HA01_N_CC	GND	DP0_C2M_N	GND	DP1_M2C_N
4	CLK2_M2C_P	GND	CLK0_M2C_P	GND	HA00_P_CC	GND	GBTCLK0_M2C_P	GND	DP9_M2C_P	GND
5	CLK2_M2C_N	GND	CLK0_M2C_N	GND	HA00_N_CC	GND	GBTCLK0_M2C_N	GND	DP9_M2C_N	GND
6	GND	HA03_P	GND	LA00_P_CC	GND	HA05_P	GND	DP0_M2C_P	GND	DP2_M2C_P
7	HA02_P	HA03_N	LA02_P	LA00_N_CC	HA04_P	HA05_N	GND	DP0_M2C_N	GND	DP2_M2C_N
8	HA02_N	GND	LA02_N	GND	HA04_N	GND	LA01_P_CC	GND	DP8_M2C_P	GND
9	GND	HA07_P	GND	LA03_P	GND	HA09_P	LA01_N_CC	GND	DP8_M2C_N	GND
10	HA06_P	HA07_N	LA04_P	LA03_N	HA08_P	HA09_N	GND	LA06_P	GND	DP3_M2C_P
11	HA06_N	GND	LA04_N	GND	HA08_N	GND	LA05_P	LA06_N	GND	DP3_M2C_N
12	GND	HA11_P	GND	LA08_P	GND	HA13_P	LA05_N	GND	DP7_M2C_P	GND
13	HA10_P	HA11_N	LA07_P	LA08_N	HA12_P	HA13_N	GND	GND	DP7_M2C_N	GND
14	HA10_N	GND	LA07_N	GND	HA12_N	GND	LA09_P	LA10_P	GND	DP4_M2C_P
15	GND	HA14_P	GND	LA12_P	GND	HA16_P	LA09_N	LA10_N	GND	DP4_M2C_N
16	HA17_P_CC	HA14_N	LA11_P	LA12_N	HA15_P	HA16_N	GND	GND	DP6_M2C_P	GND
17	HA17_N_CC	GND	LA11_N	GND	HA15_N	GND	LA13_P	GND	DP6_M2C_N	GND
18	GND	HA18_P	GND	LA16_P	GND	HA20_P	LA13_N	LA14_P	GND	DP5_M2C_P
19	HA21_P	HA18_N	LA15_P	LA16_N	HA19_P	HA20_N	GND	LA14_N	GND	DP5_M2C_N
20	HA21_N	GND	LA15_N	GND	HA19_N	GND	LA17_P_CC	GND	GBTCLK1_M2C_P	GND
21	GND	HA22_P	GND	LA20_P	GND	HB03_P	LA17_N_CC	GND	GBTCLK1_M2C_N	GND
22	HA23_P	HA22_N	LA19_P	LA20_N	HB02_P	HB03_N	GND	LA18_P_CC	GND	DP1_C2M_P
23	HA23_N	GND	LA19_N	GND	HB02_N	GND	LA23_P	LA18_N_CC	GND	DP1_C2M_N
24	GND	HB01_P	GND	LA22_P	GND	HB05_P	LA23_N	GND	DP9_C2M_P	GND
25	HB00_P_CC	HB01_N	LA21_P	LA22_N	HB04_P	HB05_N	GND	GND	DP9_C2M_N	GND
26	HB00_N_CC	GND	LA21_N	GND	HB04_N	GND	LA26_P	LA27_P	GND	DP2_C2M_P
27	GND	HB07_P	GND	LA25_P	GND	HB09_P	LA26_N	LA27_N	GND	DP2_C2M_N
28	HB06_P_CC	HB07_N	LA24_P	LA25_N	HB08_P	HB09_N	GND	GND	DP8_C2M_P	GND
29	HB06_N_CC	GND	LA24_N	GND	HB08_N	GND	TCK	GND	DP8_C2M_N	GND
30	GND	HB11_P	GND	LA29_P	GND	HB13_P	TDI	SCL	GND	DP3_C2M_P
31	HB10_P	HB11_N	LA28_P	LA29_N	HB12_P	HB13_N	TDO	SDA	GND	DP3_C2M_N
32	HB10_N	GND	LA28_N	GND	HB12_N	GND	3P3VAUX	GND	DP7_C2M_P	GND
33	GND	HB15_P	GND	LA31_P	GND	HB19_P	TMS	GND	DP7_C2M_N	GND
34	HB14_P	HB15_N	LA30_P	LA31_N	HB16_P	HB19_N	TRST_L	GA0	GND	DP4_C2M_P
35	HB14_N	GND	LA30_N	GND	HB16_N	GND	GA1	12P0V	GND	DP4_C2M_N
36	GND	HB18_P	GND	LA33_P	GND	HB21_P	3P3V	GND	DP6_C2M_P	GND
37	HB17_P_CC	HB18_N	LA32_P	LA33_N	HB20_P	HB21_N	GND	12P0V	DP6_C2M_N	GND
38	HB17_N_CC	GND	LA32_N	GND	HB20_N	GND	3P3V	GND	GND	DP5_C2M_P
39	GND	VIO_B_M2C	GND	VADJ	GND	VADJ	GND	3P3V	GND	DP5_C2M_N
40	VIO_B_M2C	GND	VADJ	GND	VADJ	GND	3P3V	GND	RES0	GND
			LPC Connector	LPC Connector			LPC Connector	LPC Connector		

Figure 3-1 FMC Connector Pin Layouts

4. Block Diagram

Figure 4-1 shows a block diagram of the TB-FMCH-VBY1 board.
The FMC connector is mounted on the solder side of the board.

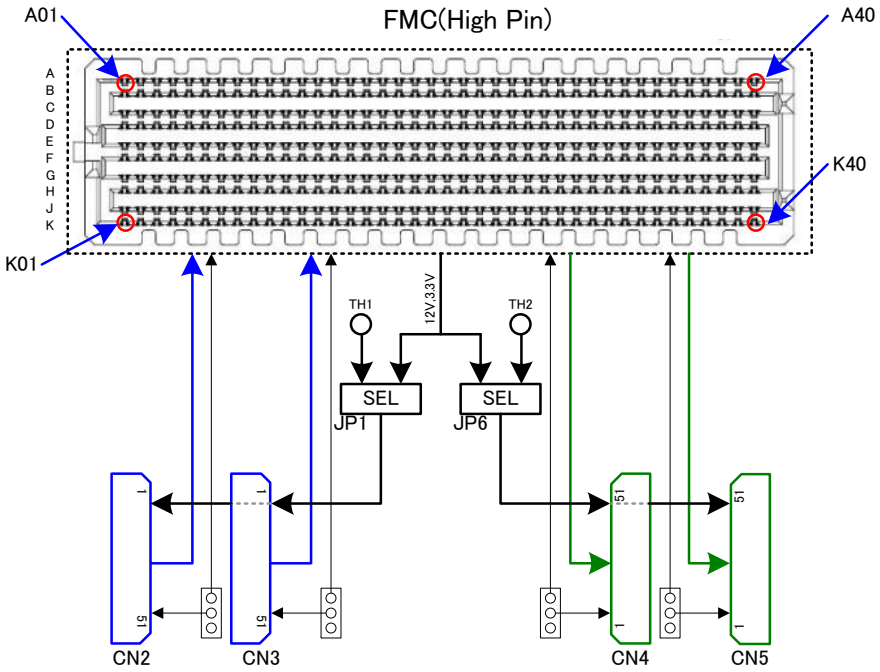

Figure 4-1 Block Diagram

Main Functions:

1. 4-pair SerDes connections between FMC and SerDes connectors(CN2 ~ 5)
2. Provide power to the SerDes connector
3. Probe points

5. External View of the Board

Figures 5-1 and 5-2 show external views of the board.

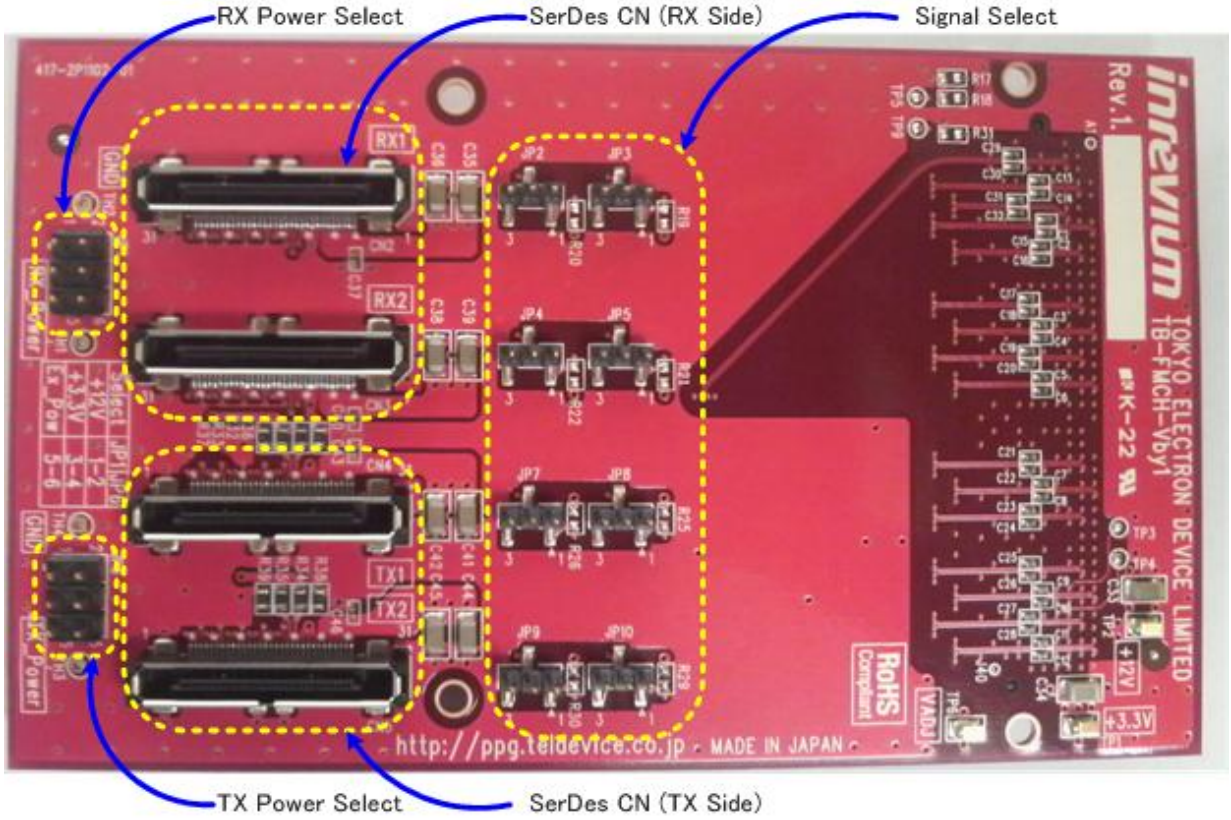

Figure 5-1 Component Side

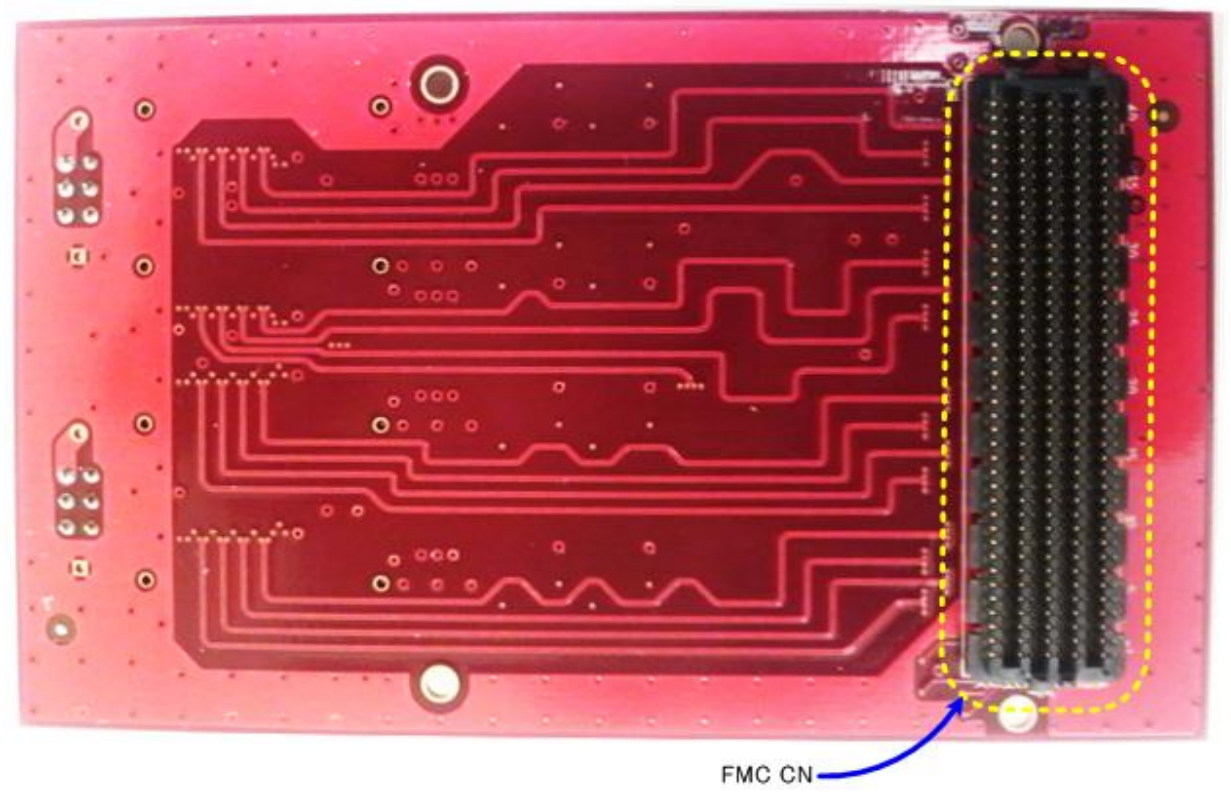

Figure 5-2 Solder Side

6. Board Specification

External Dimensions:	115 mm (W) x 69 mm (H)
Layer Structure:	8-Layer
Board Thickness:	1.6 mm
Material:	FR-4
FMC Connector:	Samtec ASP-134488-01
SerDes Connector:	Hirose FX16-31S-0.5SV

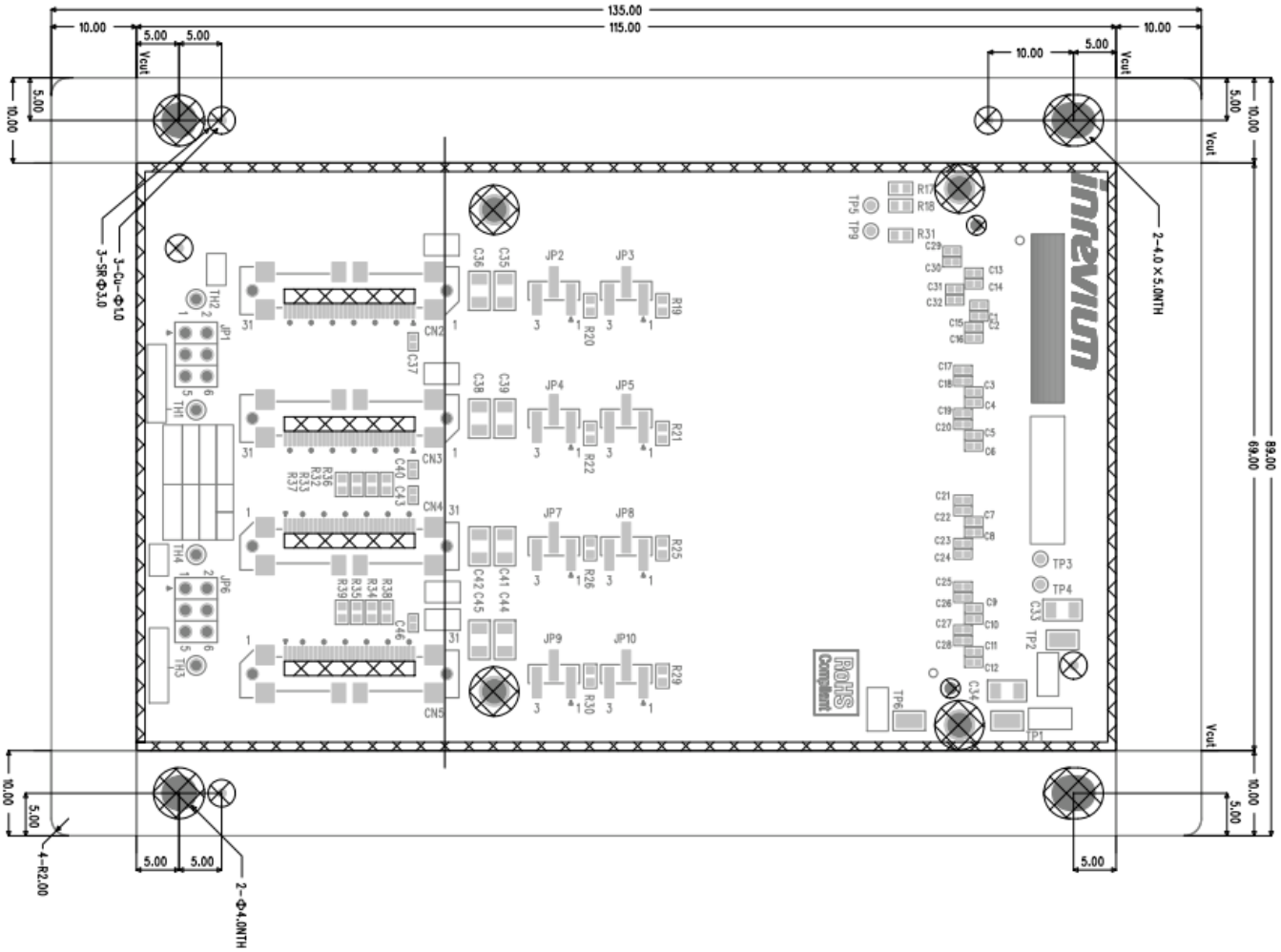

Figure 6-1 Board Dimensions (inclusive of a wasteable portion)

7. Description of Each Component

7.1. Signal connection between SerDes and FMC connectors

Table 1 shows signal connections between SerDes and FMC connectors.
The SerDes connector provides two RX signal lines and two TX signal lines.

Table7-1 RX1(CN2) Signal Connections

SerDes Side	Signal Name	FMC Side	
Pin No.		Pin No.	FMC Pin Name
1,2,3,4,5,6,7	VCC_RX*[1]	-	-
8,9,10,11,14,17,18 21,22,25,26,29	GND	-	GND
12	RX1_HTPDN*[2]	G6	LA00_P_CC
13	RX1_LOCKN*[2]	G7	LA00_N_CC
15	RX1_0_N	C7	DP0_M2C_N
16	RX1_0_P	C6	DP0_M2C_P
19	RX1_1_N	A3	DP1_M2C_N
20	RX1_1_P	A2	DP1_M2C_P
23	RX1_2_N	A7	DP2_M2C_N
24	RX1_2_P	A6	DP2_M2C_P
27	RX1_3_N	A11	DP3_M2C_N
28	RX1_3_P	A10	DP3_M2C_P
30	RX1_OPTION_A*[3]	G9	LA03_P
31	RX1_OPTION_B*[3]	G10	LA03_N

*[1] Power can be provided either from the FMC connector (12V,3.3V) or from an external power supply (JP1 setting).
For details, see **Providing Power to SerDes Connector in Section 7.2**

*[2] Bias voltage is applied to signal pins.
For details, see **SerDes Connector Option Pin Processing 1 in Section 7.3**.

*[3] These signal pins can be set to Open by setting a jumper.
For details, see **SerDes Connector Option Pin Processing 2 in Section 7.4**.

Table7-2 RX2(CN3) Signal Connections

SerDes Side	Signal Name	FMC Side	
Pin No.		Pin No.	FMC Pin Name
1,2,3,4,5,6,7	VCC_RX*[1]	-	-
8,9,10,11,14,17,18 21,22,25,26,29	GND	-	GND
12	RX2_HTPDN*[2]	G12	LA08_P
13	RX2_LOCKN*[2]	G13	LA08_N
15	RX2_0_N	A15	DP4_M2C_N
16	RX2_0_P	A14	DP4_M2C_P
19	RX2_1_N	A19	DP5_M2C_N
20	RX2_1_P	A18	DP5_M2C_P
23	RX2_2_N	B17	DP6_M2C_N
24	RX2_2_P	B16	DP6_M2C_P
27	RX2_3_N	B13	DP7_M2C_N
28	RX2_3_P	B12	DP7_M2C_P
30	RX2_OPTION_A*[3]	G15	LA12_P
31	RX2_OPTION_B*[3]	G16	LA12_N

*[1] Power can be provided either from the FMC connector (12V,3.3V) or from an external power supply (JP1 setting).
For details, see **Providing Power to SerDes Connector in Section 7.2**

*[2] Bias voltage is applied to signal pins.
For details, see **SerDes Connector Option Pin Processing 1 in Section 7.3**.

*[3] These signal pins can be set to Open by setting a jumper.
For details, see **SerDes Connector Option Pin Processing 2 in Section 7.4**.

Table7-3 TX1(CN4) Signal Connections

SerDes Side	Signal Name	FMC Side	
Pin No.		Pin No.	FMC Pin Name
25,26,27,28,29,30,31	VCC_TX*[1]	-	-
3,6,7,10,11,14,15,18 21,22,23,24	GND	-	GND
20	TX1_HTPDN*[2]	H10	LA04_P
19	TX1_LOCKN*[2]	H11	LA04_N
17	TX1_0_N	C3	DP0_C2M_N
16	TX1_0_P	C2	DP0_C2M_P
13	TX1_1_N	A23	DP1_C2M_N
12	TX1_1_P	A22	DP1_C2M_P
9	TX1_2_N	A27	DP2_C2M_N
8	TX1_2_P	A26	DP2_C2M_P
5	TX1_3_N	A31	DP3_C2M_N
4	TX1_3_P	A30	DP3_C2M_P
2	TX1_OPTION_A*[3]	H7	LA02_P
1	TX1_OPTION_B*[3]	H8	LA02_N

*[1] Power can be provided either from the FMC connector (12V,3.3V) or from an external power supply (JP6 setting).
For details, see **Providing Power to SerDes Connector in Section 7.2**

*[2] Bias voltage is applied to signal pins.
For details, see **SerDes Connector Option Pin Processing 1 in Section 7.3**.

*[3] These signal pins can be set to Open by setting a jumper.
For details, see **SerDes Connector Option Pin Processing 2 in Section 7.4**.

Table7-4 TX2(CN5) Signal Connections

SerDes Side	Signal Name	FMC Side	
Pin No.		Pin No.	FMC Pin Name
25,26,27,28,29,30,31	VCC_TX*[1]	-	-
3,6,7,10,11,14,15,18 21,22,23,24	GND	-	GND
20	TX2_HTPDN*[2]	H16	LA11_P
19	TX2_LOCKN*[2]	H17	LA11_N
17	TX2_0_N	A35	DP4_C2M_N
16	TX2_0_P	A34	DP4_C2M_P
13	TX2_1_N	A39	DP5_C2M_N
12	TX2_1_P	A38	DP5_C2M_P
9	TX2_2_N	B37	DP6_C2M_N
8	TX2_2_P	B36	DP6_C2M_P
5	TX2_3_N	B33	DP7_C2M_N
4	TX2_3_P	B32	DP7_C2M_P
2	TX2_OPTION_A*[3]	H13	LA07_P
1	TX2_OPTION_B*[3]	H14	LA07_N

*[1] Power can be provided either from the FMC connector (12V,3.3V) or from an external power supply (JP6 setting).
For details, see **Providing Power to SerDes Connector in Section 7.2**

*[2] Bias voltage is applied to signal pins.
For details, see **SerDes Connector Option Pin Processing 1 in Section 7.3**.

*[3] These signal pins can be set to Open by setting a jumper.
For details, see **SerDes Connector Option Pin Processing 2 in Section 7.4**.

7.2. Providing power to the SerDes connector

Power can be provided to the SerDes connector either from the FMC connector or from an external power supply as shown in Figure 7-1.

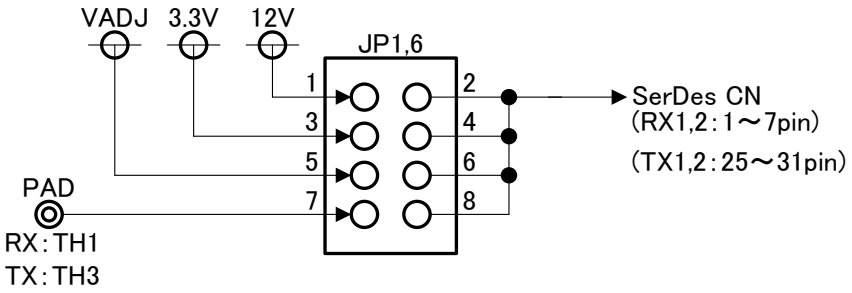

Figure 7-1 SerDes CN Power Supply

Table7-5 Power Switching Table

CN No.	Pin No.	Connect(JP1,6)			
		1-2	3-4	5-6	7-8
CN2,3(RX1,2)	1,2,3,4,5,6,7	12V	3.3V	VADJ	TH1
CN4,5(TX1,2)	25,26,27,28,29,30,31	12V	3.3V	VADJ	TH3

7.3. SerDes Connector Option Pin Processing 1

1.8 V bias voltage is applied to HTPDN/LOCKN pins in the SerDes and FMC signal connection.

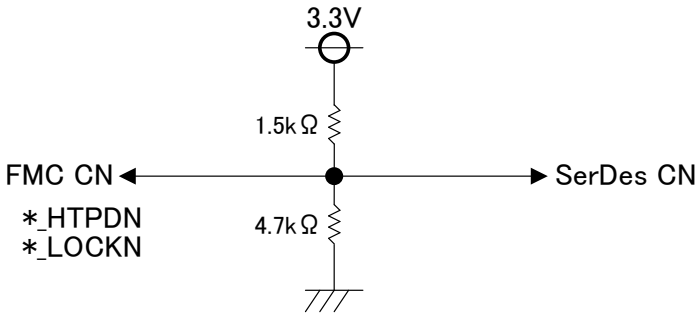

Figure 7-2 Bias Voltage Configuration

7.4. SerDes Connector Option Pin Processing 2

Two option pins can be set to Open in the SerDes and FMC signal connection.
This signal pin has a pull-up circuit for FMC Connector.

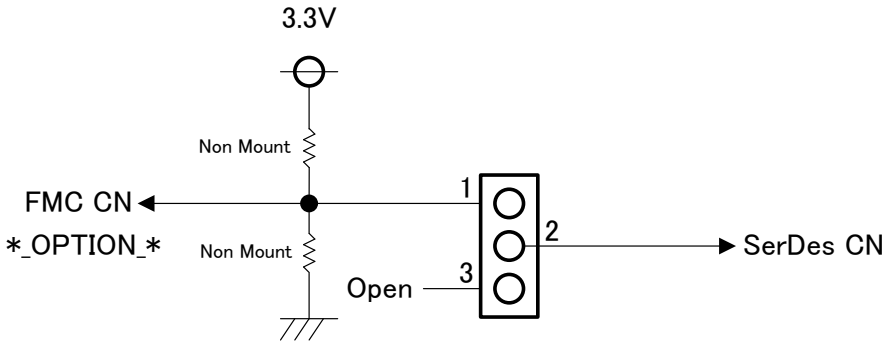

Figure 7-3 SerDes CN Power Supply

Table7-6 Power Selection

JP No.	JP Select		SerDes CN
	1-2	2-3	
JP2	J10:RX1_OPTION_B	Open	RX1(CN2):31pin
JP3	J9:RX1_OPTION_A	Open	RX1(CN2):30pin
JP4	J16:RX2_OPTION_B	Open	RX2(CN3):31pin
JP5	J15:RX2_OPTION_A	Open	RX2(CN3):30pin
JP7	K8:TX1_OPTION_B	Open	TX1(CN4):1pin
JP8	K7:TX1_OPTION_A	Open	TX1(CN4):2pin
JP9	K14:TX2_OPTION_B	Open	TX2(CN5):1pin
JP10	K13:TX2_OPTION_A	Open	TX2(CN5):2pin

7.5. FMC Connector Signal Processing

The following signal processing is performed for the FMC connector pins.

7.5.1. Power Supply

Three power lines are provided from the FMC connector. They can be monitored via Test Points shown in Table 7.

Table7-7 FMC Power Supply Pin Layouts

FMC Pin No.	Power	Test Point
C35,C37	12V	TP2
C39,D32,D36,D38,D40	3.3V	TP1
E39,F40,G39,H40	V ADJ	TP6

7.5.2. Test Points (TPs)

The board provides on-board test pads (TPs) to monitor the FMC connector pin signals

Table7-8 FMC CN Signal Test Pads

FMC Pin No.		Test PAD
Pin No.	Pin Name	
C34	GA0	TP3
D35	GA1	TP4
H1	VREF_A_M2C	TP5
K1	VREF_B_M2C	TP9

7.5.3. Signal Ground

The following signal ground structures can be implemented for the FMC connector pins. The resistors are not mounted at shipment.

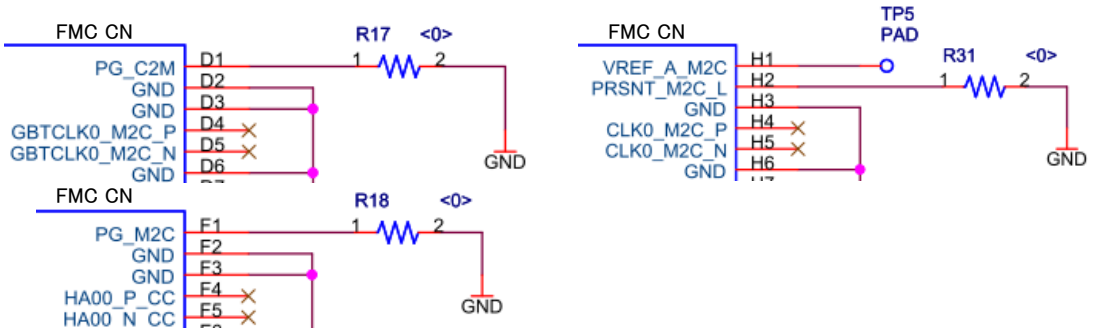

Figure 7-4 FMC CN Signal Ground Structures

Table7-9 FMC CN Signal Ground

FMC Pin No.		Resistor
Pin No.	Pin Name	
D1	PG_C2M	R17
F1	PG_M2C	R18
H2	PRSNT_M2C_L	R31

8. Factory Default Settings

Figure 8-1 shows the factory default switch settings. Look at the switch settings encompassed with dotted lines.

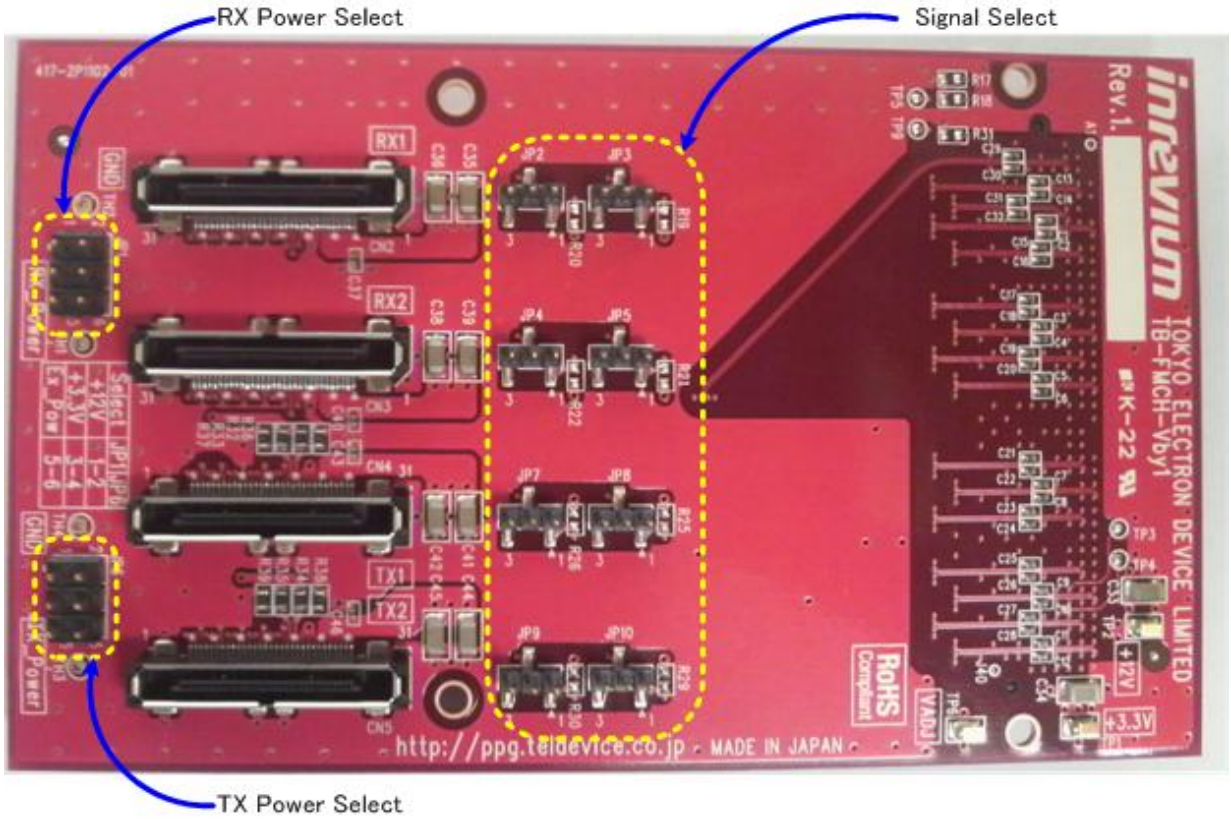

Figure 8-1 Component Side

Table8-1 Factory Default Settings

No.	Silk No.	Initial Setting	Function
1	JP1	Open	Voltage selection (12V/3.3V/TH1)
2	JP2	Open	SerDes CN signal selection (Signal/Open)
3	JP3	Open	SerDes CN signal selection (Signal/Open)
4	JP4	Open	SerDes CN signal selection (Signal/Open)
5	JP5	Open	SerDes CN signal selection (Signal/Open)
6	JP6	Open	Voltage selection (12V/3.3V/TH3)
7	JP7	Open	SerDes CN signal selection (Signal/Open)
8	JP8	Open	SerDes CN signal selection (Signal/Open)
9	JP9	Open	SerDes CN signal selection (Signal/Open)
10	JP10	Open	SerDes CN signal selection (Signal/Open)

The board comes with a short jumper socket.

EC Declaration of Conformity

Tokyo Electron Device Limited.

We declare, under our solo responsibility, that the product:

Product: V-by-1 HS Interface FMC Board
Model: TB-FMCH-VBY1

Product: Kintex-7 FPGA Evaluation Board
Model: TB-7K-325T-IMG

To which this declaration relates complies with the provisions of following European Directives:

73/23/EEC as amended by 93/68/EEC – Directive on the harmonization of the laws of Member States relating to electrical equipment designed for use within certain voltage limits;
89/336/EEC as amended by 92/31/EEC and 93/68/EEC – Directive on the approximation of the laws of the Member States relating to electromagnetic compatibility.
2004/108/EC as amended by

Allied Harmonized Standards

EN 55022(2010) Class A
EN 61000-3-2(2006) + A2(2009)
EN 61000-3-3(2008)
EN 55024(2010)

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